WHAT IS CLAIMED IS:

1   1. A method comprising:

2   receiving a request to load a device policy module into a memory, wherein the

3   device policy module is for use by a device driver, and wherein the

4   device policy module includes at least one of a function, a procedure,

5   and an object-oriented method operable to perform at least one of

6   input/output (I/O) operation scheduling, path selection, and I/O

7   operation error analysis;

8   loading the device policy module into the memory; and

9   informing the device driver of availability of the device policy module.

1   2. The method of claim 1 wherein the request to load a device policy module

2   into a memory is received form at least one of a user application and a device

3   discovery application.

1   3. The method of claim 1 wherein a portion of the memory comprises a kernel

2   memory space, and wherein the loading the device policy module into the memory

3   further comprises:

4   loading the device policy module into the kernel memory space.

1   4. The method of claim 1 wherein the informing the device driver of

2   availability of the device policy module further comprises:

3   registering the device policy module with the device driver by calling at least

4   one of a function, a procedure, and an object-oriented method

5   associated with the device driver.

1   5. The method of claim 1 further comprising:

2   determining whether the device policy module is currently present in the

3   memory.

1   6. The method of claim 1 further comprising:

2   informing the device driver of unavailability of the device policy module.

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1   7. The method of claim 6 wherein the informing the device driver of

2   unavailability of the device policy module further comprises:

3   unregistering the device policy module with the device driver by calling at

4   least one of a function, a procedure, and an object-oriented method

5   associated with the device driver.

1   8. The method of claim 1 wherein the device policy module is for use with a

2   corresponding storage device, the method further comprising:

3   transmitting at least one storage device attribute to the device driver.

1   9. The method of claim 1 wherein the at least one of a function, a procedure,

2   and an object-oriented method of the device policy module is specific to a particular

3   storage device.

1   10. The method of claim 1 wherein the at least one of a function, a procedure,

2   and an object-oriented method operable to perform at least one of I/O operation

3   scheduling, path selection, and I/O operation error analysis performs at least one of:

4   selecting one of a plurality of communication pathways to at least one storage

5   device;

6   selecting one or more sub-devices of the at least one storage device which will

7   be affected due to a communication pathway failure;

8   selecting an alternate communication pathway in case of a failure of one of the

9   plurality of communication pathways;

10   changing a current communications pathway from a first one of the plurality

11   of communication pathways to a second one of the plurality of

12   communication pathways;

13   responding to SCSI reservation/release requests; and

14   selectively transmitting I/O operations along at least two of the plurality of

15   communication pathways to the at least one storage device.

1   11. The method of claim 1 further comprising:

2   monitoring operation of the device policy module.

1   12. The method of claim 1 further comprising:

2   discovering the presence of at least one storage device belonging to a

3   distributed computing system.

1   13. The method of claim 12 further comprising:

2   determining whether the at least one storage device has a corresponding

3   device policy module.

1   14. A system comprising:

2   a storage device discovery module configured to determine information about

3   at least one storage device belonging to a distributed computing

4   system; and

5   a multipath driver in communication with the storage device discovery module

6   and configured to direct input/output (I/O) operations along at least one

7   of a plurality of communication pathways to the at least one storage

8   device, the multipath driver including:

9   an interface configured to communicate with a device policy module

10   including at least one of a function, a procedure, and an object-

11   oriented method operable to perform at least one of I/O

12   operation scheduling, path selection, and I/O operation error

13   analysis.

1   15. The system of claim 14 further comprising:

2   a device policy module including at least one of a function, a procedure, and

3   an object-oriented method operable to perform at least one of I/O

4   operation scheduling, path selection, and I/O operation error analysis.

1   16. The system of claim 15 wherein the at least one of a function, a

2 procedure, and an object-oriented method of the device policy module is specific to a

3 particular storage device.

1   17. The system of claim 14 wherein the at least one of a function, a

2 procedure, and an object-oriented method operable to perform at least one of I/O

3 operation scheduling, path selection, and I/O operation error analysis performs at least

4 one of:

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5   select one of the plurality of communication pathways to the at least one

6   storage device;

7   select one or more sub-devices of the at least one storage device which will be

8   affected due to a communication pathway failure;

9   select an alternate communication pathway in case of a failure of one of the

10   plurality of communication pathways;

11   effect a communications pathway changeover;

12   respond to respond to SCSI reservation/release requests; and

13   selectively transmit I/O operations along at least two of the plurality of

14   communication pathways to the at least one storage device.

1   18. The system of claim 17 wherein the at least one storage device is a disk

2 array and wherein the one or more sub-devices are disk drives.

1   19. The system of claim 14 further comprising:

2   a memory; and

3   a processor coupled to the memory, wherein at least one of the storage device

4   discovery module and multipath driver are encoded as instructions

5   stored in the memory and executable on the processor.

1   20. The system of claim 19 wherein a first portion of the memory is used as a

2 kernel memory space and wherein a second portion of the memory is used as a user

3 memory space, and wherein the multipath driver is stored in the kernel memory space.

1   21. The system of claim 14 wherein the multipath driver further comprises:

2   a fixed set of I/O policies including at least one of a function, a procedure, and

3   an object-oriented method operable to perform at least one of I/O

4   operation scheduling, path selection, and I/O operation error analysis.

1   22. The system of claim 14 wherein the interface configured to communicate

2 with a device policy module includes at least one of a function, a procedure, and an

3 object-oriented method operable to perform at least one of registering a device policy

4 module with the multipath driver and unregistering a device policy module with the

5 multipath driver.

1   23. The system of claim 14 wherein the multipath driver is further configured
2   to monitor at least one loaded device policy module.

1   24. The system of claim 14 wherein the multipath driver is further configured
2   to receive at least one of a request to load a device policy module and a request to
3   unload a device policy module.

1   25. The system of claim 14 wherein the information about at least one storage
2   device includes at least one device attribute and wherein the device discovery module
3   is further configured to transmit the information about at least one storage device to
4   the multipath driver.

1   26. The system of claim 25 wherein the at least one device attribute includes
2   at least one of: a number of paths to the device, primary path information, secondary
3   path information, connected path information, disconnected path information, vendor
4   information, an enclosure serial number, and an LUN serial number, an array type.

1   27. The system of claim 14 wherein the storage device discovery module is
2   further configured to transmit the information about at least one storage device to the
3   multipath driver.

1   28. The system of claim 14 wherein the storage device discovery module is
2   further configured to receive at least one of a request to load a device policy module
3   and a request to unload a device policy module.

1   29. A computer readable medium comprising program instructions executable
2   on a processor, the computer readable medium being at least one of an electronic
3   storage medium, a magnetic storage medium, an optical storage medium, and a
4   communications medium conveying signals encoding the instructions, wherein the
5   program instructions are operable to implement each of:
6   receiving a request to load a device policy module into a memory, wherein the
7   device policy module is for use by a device driver, and wherein the
8   device policy module includes at least one of a function, a procedure,
9   and an object-oriented method operable to perform at least one of

10   input/output (I/O) operation scheduling, path selection, and I/O

11   operation error analysis;

12   loading the device policy module into the memory; and

13   registering the device policy module with the device driver.

1   30. The computer readable medium of claim 29 wherein the request to load a

2 device policy module into a memory is received form at least one of a user application

3 and a device discovery application.

1   31. The computer readable medium of claim 29 wherein a portion of the

2 memory comprises a kernel memory space, and wherein the program instructions

3 operable to implement the loading the device policy module into the memory further

4 comprise program instructions operable to implement:

5   loading the device policy module into the kernel memory space.

1   32. The computer readable medium of claim 29 wherein the program

2 instructions operable to implement the registering the device policy module with the

3 device driver further comprise program instructions operable to implement:

4   calling at least one of a function, a procedure, and an object-oriented method

5   associated with the device driver.

1   33. The computer readable medium of claim 29 further comprising program

2 instructions operable to implement:

3   determining whether the device policy module is currently present in the

4   memory.

1   34. The computer readable medium of claim 29 wherein the at least one of a

2 function, a procedure, and an object-oriented method of the device policy module is

3 specific to a particular storage device.

1   35. The computer readable medium of claim 29 wherein the at least one of a

2 function, a procedure, and an object-oriented method operable to perform at least one

3 of I/O operation scheduling, path selection, and I/O operation error analysis comprises

4 program instructions operable to perform at least one of:

5   selecting one of a plurality of communication pathways to at least one storage

6   device;

7   selecting one or more sub-devices of the at least one storage device which will

8   be affected due to a communication pathway failure;

9   selecting an alternate communication pathway in case of a failure of one of the

10   plurality of communication pathways;

11   changing a current communications pathway from a first one of the plurality

12   of communication pathways to a second one of the plurality of

13   communication pathways;

14   responding to SCSI reservation/release requests; and

15   selectively transmitting I/O operations along at least two of the plurality of

16   communication pathways to the at least one storage device.

1   36. The computer readable medium of claim 29 further comprising program

2   instructions operable to implement:

3   monitoring operation of the device policy module.

1   37. An apparatus comprising:

2   a means for directing input/output (I/O) operations along at least one of a

3   plurality of communication pathways to at least one storage device;

4   a means for providing storage device specific I/O operation scheduling and

5   communication pathway selection in conjunction with the means for

6   directing I/O operations; and

7   a means for selectively making the means for providing storage device

8   specific I/O operation scheduling and communication pathway

9   selection available to the means for directing I/O operations.

1   38. The apparatus of claim 37 further comprising:

2   a means for discovering the presence of at least one storage device belonging;

3   and

4   a means for communicating information about the at least one storage device

5   to the means for directing I/O operations.

1   39. The apparatus of claim 37 further comprising:

2   a means for registering the means for providing storage device specific I/O

3   operation scheduling and communication pathway selection with the

4   means for directing I/O operations.

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1   40. The apparatus of claim 37 wherein the means for directing I/O operations

2 further comprises a means for providing a fixed set of I/O policies including at least

3 one of a function, a procedure, and an object-oriented method operable to perform at

4 least one of I/O operation scheduling, path selection, and I/O operation error analysis.